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Brave men and timid women? A review of the gender differences in fear and anxiety

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ABSTRACT

Substantial evidence indicates that women report greater fear and are more likely to develop anxiety disorders than men. Women's greater vulnerability for anxiety disorders can be partly understood by examining gender differences in the etiological factors known to contribute to anxiety. This review examines evidence for gender differences across a broad range of relevant factors, including biological influences, temperamental factors, stress and trauma, cognitive factors, and environmental factors. Gender differences are observed with increasing consistency as the scope of analysis broadens to molar levels of functioning. Socialization processes cultivate and promote processes related to anxiety, and moderate gender differences across levels of analysis.

Contents

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Based on established findings (e.g., Bourdon et al., 1988; Weissman & Merikangas, 1986), most well-articulated research hypotheses predict that women report and/or demonstrate greater fear and anxiety than men. However, the rationale for this expected finding is often absent or refers only to known gender disparities in prevalence rates of anxiety disorders. This circular reasoning highlights the need to identify complex processes that underlie gender differences in anxiety. By delineating the mechanisms that promote and maintain fear and anxiety among men and women, prevention and treatment efforts may be improved.

The purpose of the present paper is to review evidence of gender[1] differences in anxiety and fear. Results of a comprehensive literature search using electronic databases (PsycInfo, Pubmed) are reviewed from a biosystemic model in which gender-specific vulnerabilities at molecular levels of analysis gradually evolve into fully articulated traits through complex, bidirectional interactions with molar level factors. Within this model, men and women are identified as complex systems comprised of various interrelating mechanisms. For heuristic purposes, these mechanisms are organized into several levels of functioning arranged along a continuum of complexity. Processes occurring at any given level are presumed to influence functioning at all other levels. Thus, it is hypothesized that individual differences in etiological factors for anxiety and fear are moderated by socialization processes that prescribe gender-specific expectations for expression of anxiety and the acceptable means of coping with anxiety. These socialization factors influence expression of traits by shaping patterns of reinforcement that cultivate and promote processes related to anxiety.

First, we provide a brief overview of prevalence of reported fear and anxiety disorders across gender, including developmental patterns that likely contribute to these differences. Next, we review gender differences in etiological factors beginning with biological factors including genetic factors, physiological reactivity, hormonal factors, and evolutionary influences. Broad temperamental factors are examined next, including higher order factors, such as negative affectivity, and disorder specific factors, such as anxiety sensitivity and disgust sensitivity. Moving toward more molar levels of analysis, we review gender differences in stress and trauma-related factors, and then examine the cognitive processes associated with anxiety, including appraisals of threat, uncontrollability, worry and rumination, and sensitivity to social cues. Last, we review gender differences in relevant environmental factors, including sociocultural and modeling factors.

1. Evidence of gender differences

1.1. Gender differences in fear

Gender differences in fear reporting are evident in children as young as 9–12 years of age (Ollendick, 1983). Among adults, a number of self-report studies indicate that women endorse a greater number and severity of fears than men (e.g., Arrindell, 2000; Bourdon et al., 1988; Davey, 1994). For example, Tucker and Bond (1997) found significant gender differences in fear of repulsive animals (e.g., snakes) and fear of harmless animals (e.g., dogs), but no differences in fears of bodily injury, social fears, noise fears, or other classic phobias (e.g. enclosed spaces). Consistent with this result, large scale cross-cultural studies have found that *gender disparities are greatest* in fears of harmless animals (Arrindell, Eisemann, Richter, Oei, & Caballo, 2003) and disgust-relevant animals (Davey, McDonald, & Hirisave, 1998) than for fear-relevant animals (e.g., lions, sharks). In contrast, few gender differences have been found for public speaking or social-evaluative fears (Klorman, 1974), possibly due to socialization influences discussed later in this review.

1.2. Gender differences in anxiety disorders

Among children, girls are more likely than boys to experience any anxiety disorder (Anderson, Williams, McGee, & Silva, 1987). For example, in a community sample of 1079 adolescents, Lewinsohn, Gotlib, Lewinsohn, Seeley, and Allen (1998), found that girls were more likely than boys to have a current or lifetime diagnosis of an anxiety disorder. Early childhood appears to mark a period of increasing vulnerability to excessive anxiety among girls. By age six, girls are twice as likely as boys to have experienced an anxiety disorder (Anderson et al., 1987; Lewinsohn et al., 1998), a divergence that appears to continue throughout adolescence (Muris & Ollendick, 2002). Adolescent girls report a greater number of worries, more separation anxiety (Campbell & Rapee, 1994; Costello, Egger, & Angold, 2003; Poulton, Milne, Craske, & Menzies, 2001), and are six times more likely to develop generalized anxiety disorder (GAD) than adolescent boys (Bowen, Offord, & Boyle, 1990; McGee et al., 1990). Childhood obsessive compulsive disorder (OCD) is nearly three times as common among boys (Castle, Deale, & Marks, 1995; Karno, Golding, Sorenson, & Burman, 1988) until puberty, at which time the gender differences equalize and then reverse (Pigott, 1998; Rasmussen & Eisen, 1990).

Similar evidence for gender differences exists in adult samples. Large community-based, epidemiological studies show that women are at greater risk than men for most anxiety disorders (Angst & Dobler-Mikola, 1985; Bruce, Yonkers, Otto, Eisen, & Weisberg, 2005). According to lifetime prevalence data from the National Comorbidity Survey, women are more likely than men to have panic disorder, agoraphobia, GAD (Kessler, McGonagle, Zhao, Nelson, & Hughes, 1994), and posttraumatic stress disorder (PTSD) (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Women are approximately twice as likely to meet criteria for certain phobias (Líndal & Stefánsson, 1993), with the pattern of gender differences mirroring research on fear reporting (Himle, McPhee, Cameron, & Curtis, 1989). Gender differences appear to be the least pronounced for social anxiety disorder (SAD) and OCD (Breslau, Chilcoat, Peterson, & Schultz, 2000; Karno & Golding, 1991).

Findings among clinical samples generally parallel community-based samples. For example, a large study conducted by the World Health Organization in 15 countries found that women were consistently more likely than men to present for treatment of panic disorder with agoraphobia (Gater et al., 1998). In contrast to this general parallel between clinical and community samples, men and women with SAD appear equally likely to seek treatment despite evidence from research among community samples suggesting that women are slightly more likely to have social anxiety disorder (Katzelnick & Greist, 2001).

[1] Throughout this review, the term *gender* will be used to refer to both sex and gender, except in cases where measures of gender role are included to control for the sociocultural and psychological processes inherent to the construct of gender.

1.3. Gender differences within anxiety disorders

In addition to gender differences across anxiety disorders, there are also differences within anxiety disorders in terms of chronicity, symptomology, and patterns of comorbidity. Panic attacks are experienced at equal rates among men and women (Telch, Lucas, & Nelson, 1989), but certain symptoms of panic attacks, such as shortness of breath, faintness, and smothering sensations are more commonly described as primary panic symptoms among women than men (Sheikh, Leskin, & Klein, 2002). In terms of course, panic disorder is more chronic among women than men (Hollifield et al., 1997; Yonkers et al., 1998) and is associated with higher rates of comorbidity with GAD, somatization disorder, and agoraphobia (Pigott, 1999; Turgeon, Marchand, & Dupuis, 1998). However, the most striking gender difference is observed across levels of agoraphobic avoidance, in which women are disproportionately represented within the highest levels of agoraphobia (Cameron & Hill, 1989; Turgeon et al., 1998).

Although there are some inconsistencies in the literature, women with OCD appear more likely to exhibit cleaning compulsions and aggressive obsessions, while men more commonly exhibit obsessive slowness, symmetry obsessions/compulsions, touching rituals, and sexual or "odd" symptoms (Castle et al., 1995). Further, men who are affected by OCD tend to have an earlier onset and exhibit a chronic, rather than episodic course (Castle et al., 1995; Pigott, 1998).

Research has found that the rates for pure anxiety disorders (i.e. no comorbid diagnoses) are similar across men and women (Ochoa, Beck, & Steer, 1992). Yet, among individuals with anxiety disorders, comorbid substance use disorders are more common among men (Cox, Swinson, & Shulman, 1993), whereas comorbid mood disorders are more common among women (Ochoa et al., 1992; Scheibe & Albus, 1992). Another study demonstrated higher rates of comorbidity and severity among females in the hoarding sub-type of OCD (Wheaton, Timpano, LaSalle-Ricci, & Murphy, 2008).

2. Overview of etiological factors

Women's greater vulnerability for anxiety can be partly understood by examining etiological factors related to anxiety across levels of analysis. Beginning with an examination of biological factors, the scope of analysis in this review increases at each level. Although divisions between levels are somewhat arbitrary, they are heuristically useful for purposes of investigation and review.

2.1. Biological factors

2.1.1. Genetic factors

A large body of evidence supports a substantial nonspecific genetic contribution to anxiety disorders (Barlow, 2000). Within specific phobias, genetic factors are estimated to account for up to one third of the total variance (Kendler, Neale, Kessler, Heath, & Eaves, 1992) with the greatest contribution among animal phobias (see Muris & Merckelbach, 2001). Panic disorder also has been found to run in families (Goldstein, Wickramaratne, Horwath, & Weissman, 1997) and has demonstrated a high degree of heritability in twin studies (Perna, Caldirola, Arancio, & Bellodi, 1997). The heritability of panic disorder has been hypothesized to reflect the genetic transmission of physiologic risk factors, such as carbon dioxide hypersensitivity (Perna, Bertani, Caldirola, & Bellodi, 1996).

Genetic factors have been shown to relate with anxiety sensitivity (Stein, Jang, & Livesly, 2002) and with other broad vulnerability factors such as neuroticism. In fact, twin studies show that approximately 50% of the variance in neuroticism is accounted for by genetic factors (Lake, Eaves, Maes, Heath, & Martin, 2000). Heritability of these vulnerability factors helps to explain findings that indicate a genetic influence among anxiety disorders which are clearly connected to environmental factors. For example, higher concordance ratios are found for PTSD among monozygotic than dizygotic twins (Skre, Onstad, Torgersen, Lygren, & Kringlen, 1993), even when controlling for type of trauma exposure (True et al., 1993). Relevant to our understanding of gender differences are data showing that the heritability of anxiety-related vulnerability factors is greater among women than men. Lake and colleagues (2000) found that genetic factors had a significantly greater influence on the individual variability in neuroticism among women than men. Similarly, research with child and adolescent samples consistently shows higher heritability estimates for fear and phobias for girls than boys (Eley, 2001). Such evidence suggests that gender differences in anxiety may largely correspond with a differential genetic predisposition to anxiety disorders or their related vulnerability factors.

Alternatively, weaker heritability estimates of anxiety-related vulnerability factors among men could signify that processes at higher levels of analysis counteract inherited tendencies among boys. Thus, genetic vulnerabilities may be more supported by the social/environmental influences experienced by girls. This hypothesis is consistent with the results of a large twin study recently conducted by Hettema, Prescott, Myers, Neale, and Kendler (2005). In a sample of over 5000 participants, structural equation modeling was used to examine the underlying causes of comorbidity within anxiety disorders. Results showed that despite a nearly two-fold higher prevalence among women, genetic and environmental risk factors for anxiety disorders were similar across gender. Thus, while the types of genetic factors that place individuals at risk for experiencing anxiety disorders may be the same across gender, the relative impact of genetic factors may be greater among women.

2.1.2. Physiological reactivity

The hypothesis that women are more physiologically predisposed to experience anxiety has not been consistently supported. Studies examining skin conductance within conditioning and extinction paradigms have found greater reactivity among men than women: men display higher levels of responding during classical conditioning tasks (Graham, Cohen, & Schmavonian, 1966), slower rates of habituation to a nocuous tone (Maltzman, 1979), and greater responding across vicarious conditioning tasks (Craig & Lowery, 1969).

In contrast to findings from conditioning paradigms, research examining physiological reactivity in response to acute behavioral stress has yielded different results. Several studies have found that men and women show similar levels of reactivity, as measured by skin conductance in response to fearful stimuli (Katkin & Hoffman, 1976), heart rate during social stress challenge (Kelly, Tyrka, Anderson, Price, & Carpenter, 2008), electrodermal reactivity, heart rate during CO_2 inhalation (Kelly, Forsyth, & Karekla (2006) M.M. Kelly, J.P. Forsyth and M. Karekla, Sex differences in response to a panicogenic biological challenge procedure: An experimental evaluation of panic vulnerability in a non-clinical sample, *Behaviour Research and Therapy* 44 (2006), pp. 1421–1430. Article | PDF (198 K) | View Record in Scopus | Cited By in Scopus (6)Kelly et al., 2006), and heart rate during oral examination (Rohrmann, Netter, Hennig, & Hodapp, 2003). However, results from a meta-analysis of 12 psychophysiological studies found that women had slightly higher heart rates at rest than men and there was a trend of toward higher heart rates during challenge tasks but that men had higher systolic blood pressure in both of these conditions (Stoney, Davis, & Matthews, 1987). In terms of autonomic nervous system responding to acute stress, a recent review by Kajantie and Phillips (2006) concluded that gender differences among adults are marked and consistent; women show lower hypothalamic–pituitary–adrenal axis (HPAA) and autonomic reactivity compared to men.

In sum, evidence for gender differences in physiological reactivity seems to depend on how physiological reactivity is operationalized.

Men show greater responding when reactivity is defined as skin conductance during conditioning/extinction, blood pressure during challenge, and HPAA reactivity during challenge; women show greater responding when reactivity is defined as heart rate during rest, and few gender differences are observed when reactivity is operationalized as heart rate during challenge. In addition to methodological differences, another source of variance across these studies is women's hormonal status. Based on their analyses of the age and hormonal status of the sample (when reported) Kajantie and Phillips (2006) concluded that adult women are less reactive than men (lower HPAA and autonomic responding) between puberty and menopause, show increased reactivity during the luteal phase and decreased activity during pregnancy and after menopause. Thus, gender differences in physiological reactivity seem to depend on how physiological reactivity is operationalized and may also be influenced by women's hormonal status.

2.1.3. Hormonal influences

Several studies examining levels of stress hormones during anxious responding show that men and women exhibit similar cortisol reactivity during acute stress (Kirschbaum, Kudielka, Gaab, Schommer, & Hellhammer, 1999; Kirschbaum, Wüst, & Hellhammer, 1992; Stoney et al., 1987), although some studies show that men increase their output of adrenaline during acute stress relative to women (Elwood, Ferguson, & Thakar, 1986; Rauste-von Wright, von Wright, & Frankenhaueser, 1981).

Hormonal fluctuations related to reproductive events have been advanced as a possible contributor to the gender differences in anxiety. Although Hedlund and Chambless (1990) found no evidence that women are differentially susceptible to conditioning at various times of their menstrual cycle, the hormonal changes related to menstruation and reproductive stages have been associated with increased anxiety among women. For example, state anxiety has been found to increase during the late luteal phase of the menstrual cycle (Pearlstein et al., 1990) and during pregnancy (Phillips, Dennerstein, & Farish, 1996). This is consistent with research reviewed by Kajantie and Philips (2006), who noted that during the luteal phase of the menstrual cycle, cortisol output among women is elevated to levels that are similar to men.

According to both retrospective studies (Williams & Koran, 1997) and prospective studies (McLeod, Hoehn-Saric, Foster, & Hipsley, 1993), existing anxiety disorders may be exacerbated during the premenstrual phase, as evidenced by increased symptom ratings. Pregnancy among women with panic disorder seems to have a variable effect on symptom intensity. A review of 8 non-controlled studies (all but one were retrospective) by Hertzberg and Wahlbeck (1999) found equivocal results: panic symptoms improved during pregnancy in 41% of women, but that 38% experienced an exacerbation of symptoms. Among women with OCD, a retrospective study by Williams and Koran (1997) found evidence of premenstrual and postpartum exacerbation of symptoms. Pregnancy and postpartum have been identified as periods of increased vulnerability for the development of OCD (Diaz, Grush, Sichel, & Cohen, 1997; Rasmussen & Eisen, 1990; Ross & McLean, 2006). However, given lack of controlled studies, reliance on retrospective self-report, and the fact that puberty, pregnancy, and childbirth are often periods of considerable stress, it is difficult to attribute disorder onset or exacerbation to co-occurring hormonal changes.

2.1.4. Evolutionary influences

In an extensive review of hormonal and physiological data related to the experience of fear and anxiety, Taylor et al. (2000) argued that the familiar *fight-or-flight* characterization of the human stress response does not accurately describe the behavioral response of women. In contrast to the flight-or-flight response, which, as the authors noted, could compromise pregnancy or put women and their offspring at risk, the authors assert that the female response is marked by a pattern of behavior which they termed *tend-and-befriend*. Tending behaviors include nurturing activities designed to protect the self and offspring, promote safety, and reduce distress, while befriending behaviors create and maintain social networks. According to the evidence reviewed by Taylor et al. (2000), oxytocin and other endogenous opioids appear to underlie these attachment and caregiving behaviors such that when stressed, greater oxytocin production among women has a calming effect that promotes affiliation. Taylor and colleagues support this hypothesis by citing research indicating that higher levels of oxytocin are associated with lower arousal, lower stress responding, and more social behavior. Greater oxytocin production could help to explain findings of weaker adrenocortical responding among male infants (Davis & Emory, 1995) and adults Kajantie and Phillips (2006) in response to stress cues.

Craske (2003) speculates that need to protect and nurture others, while protective against imminent threat, may help to explain evidence of greater worrying among women when faced with potential threats. A tendency to respond to threat by befriending or by seeking support from others, as opposed to relying on one's own personal coping resources may decrease women's self-efficacy (Craske, 2003). The role of self-efficacy in the onset and maintenance of anxiety is discussed in greater detail in a later section.

2.2. Broad vulnerability factors: higher order factors

2.2.1. Negative affectivity

Negative affectivity is strongly linked with both anxiety and mood disorders (Norton, Sexton, Walker, & Norton, 2005). As expected, negative affectivity is more often observed among girls (Steiner, Ryst, Berkowitz, Gschwendt, & Koopman, 2002) and adult women across cultures (Lynn & Martin, 1997; Costa, Terracciano, & McCrae, 2001). During the first few months of life, however, boys show greater negative affect than girls (Davis & Emory, 1995; Weinberg, Tronick, Cohn, & Olson, 1999). Only at around age two does this pattern reverse, with girls beginning to show a greater propensity to negative affectivity (Arcus & Kagan, 1995). This shift occurs at approximately the same age in which the effects of gender socialization become evident (Craske, 2003; Martin, Ruble, & Szkrybalo, 2002). Girls report increasingly higher levels of negative affectivity as they mature, whereas levels remain stable among boys during the same period (McCrae, Costa, & Terracciano, 2002). Thus, gender differences in negative affectivity become increasingly divergent as the influence of biological factors attenuates relative to the influence of environmental experience (Lonigan & Phillips, 2001).

2.2.2. Trait anxiety

The construct of trait anxiety (Spielberger, 1966, 1972) is conceptually similar to negative affectivity (Barlow, 2000; Zinbarg & Barlow, 1996), and women generally score higher on measures of trait anxiety such as the State/Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). Among individuals with panic disorder, one study has found greater trait anxiety among women than men with panic disorder (Chambless & Mason, 1986), but other studies have not replicated this finding (Turgeon et al., 1998; Foot & Koszycki, 2004) and it has been suggested that the differences detected by Chambless and Mason (1986) may have been statistically but not clinically significant. Possibly, the magnitude of gender differences varies depending on how trait anxiety is measured. For example, Bander and Betz (1981) found few gender differences when using a measure of trait anxiety that emphasizes physiological indicators (the S-R Inventory; Endler, Hunt, & Rosenstein, 1962), but found that women scored higher than men on the STAI, which reflects cognitive and affective indicators of trait anxiety. A tendency for women to manifest trait anxiety predominately within cognitive/affective domains rather than within the physiological domain is consistent

with studies showing few gender differences in physiological reactivity (Kelly, Forsyth, et al., 2006, Kelly, Tyrka, et al., 2008).

2.3. Broad vulnerability factors: disorder specific factors

2.3.1. Anxiety sensitivity

Taylor (1998) and others have emphasized the need for hierarchical models of anxiety to consider disorder-specific risk factors, such as anxiety sensitivity (AS). AS, defined as the fear of anxiety and anxiety-related sensations (Reiss & McNally, 1985), is a risk factor for several anxiety disorders, and is strongly associated with panic disorder (Zinbarg & Barlow, 1996). Several studies have found evidence of greater AS among women within both non-clinical samples of adolescents (Bernstein, Zvolensky, Stewart, Comeau, & Leen-Felder, 2006) and adults (Deacon, Abramowitz, Woods, & Tolin, 2003; Stewart, Taylor, & Baker, 1997; Zvolensky, McNeil, Porter, & Stewart, 2001). Research among clinical samples, however, has been less consistent. Schmidt and Koselka (2000) found significantly greater AS among women with PD than men with PD, whereas Foot and Koszycki (2004) found no gender differences. Measurement of AS, sample characteristics, and methods were similar in both of these studies and therefore, the discrepancy in findings is difficult to interpret.

More consistent gender differences have been found within certain dimensions of AS. Although taxometric studies of AS reveal a similar factor structure for men and women (Dehon, Weems, Stickle, Costa, & Berman, 2005; Stewart et al., 1997), women report greater fear of the physical consequences of anxiety (Stewart et al., 1997), whereas men report greater fear of the social consequences of anxiety (Foot & Koszycki, 2004). The physical concerns factor of AS is considered especially relevant to the etiology of panic (McNally, 1993; Zinbarg, Barlow, & Brown, 1997). Thus, gender differences within a particular dimension of AS may explain an increased risk for panic disorder among women. One possible explanation for this finding is that women objectively experience more physiological symptoms of anxiety than men; women's elevated concern may simply correspond with the extent of their physical symptoms. However, although women report a greater number of symptoms during panic attacks (Dick, Bland, & Newman, 1994; Ströhle, 2000), the mixed findings of research examining gender differences in physiological reactivity do not provide clear support for this hypothesis.

Another possible explanation for gender differences within a particular dimension of AS is that physical symptoms are experienced by men and women equally, but women receive more positive reinforcement for expressing concern toward these symptoms. Over time, such reinforcement could increase self-focused attention that would contribute to actual differences in the experience of physical symptoms. In support of this hypothesis, retrospective studies have found that women are more likely than men to recall being reinforced for expressing somatic concerns (Ehlers, 1993). According to Watt, Stewart, and Cox (1998), men who are discouraged from expressing somatic complaints may suppress them. Instead, they may attend to feared social consequences of visible anxiety symptoms, which could explain why men score higher on the social concerns sub-factor of AS than women (Foot & Koszycki, 2004; Stewart et al., 1997). The mechanisms that account for differences in AS among men and women and how these differences relate to the development of panic disorder have yet to be elucidated.

2.3.2. Disgust sensitivity

Disgust and contamination sensitivity are closely related disorder-specific vulnerability factors that have been associated with animal phobias (e.g., Arrindell, Mulkens, & Kok, 1999; Arrindell, 2000). Consistent with the higher prevalence among women for certain types of phobias, several studies indicate that women report greater disgust sensitivity than men (Connolly, Olatunji, & Lohr, 2008; Olatunji, Arrindell, & Lohr, 2005). In fact, Davey (1994) found that the gender differences in animal fears were largely accounted for by women's higher levels of disgust sensitivity. Similar findings were reported by Olatunji and colleagues (2005), who found that the relationship between gender and blood-injection-injury fears was significantly mediated by differences in disgust sensitivity.

2.4. Stress and trauma

2.4.1. Gender-specific trauma

Although women experience fewer traumas than men, they are more likely to experience potentially traumatic events (PTEs) including rape, attempted rape (Koss, Gidycz, & Wisniewski, 1987), and domestic abuse (McHugh, Frieze, & Browne, 1993), that are associated with a high probability of PTSD or other anxiety disorders (Breslau & Anthony, 2007). Women also are more likely than men to experience relationship stressors involving acquaintances, friends, or loved ones, which are referred to as “social network crises” (Kessler & McLeod, 1984). Social network crises may have as much impact on emotional functioning as more commonly identified PTEs (Gold, Marx, Soler-Baillo, & Sloan, 2005). In fact, individuals who have experienced aversive events not subsumed under the DSM-IV-TR definition of a Criterion A traumatic event, such as an unexpected death or serious illness of a loved one, have shown greater PTSD symptomology than individuals who have experienced events classified as traumatic (Gold et al., 2005).

2.4.2. Resiliency

There are several possible explanations for why, even when controlling for trauma type, women are more likely than men to develop PTSD (Kessler et al., 1995; Tolin & Foa, 2006). One explanation is that men and women employ differentially effective coping strategies following exposure to PTEs. Compared to active, problem-focused coping, emotion-based coping strategies (e.g. positive reinterpretation, mental disengagement, denial) are generally less effective in reducing distress (Carver, Scheier, & Weintraub, 1989) and have been associated with greater PTSD symptomology (Blake, Cook, & Keane, 1992). Women tend to use emotion-focused coping more often than men in response to moderately stressful situations (Thoits, 1987). Women's greater tendency to ruminate (discussed further below) may increase their risk for PTSD by inflating the threat-value of PTEs and thereby fostering fearful responding and encouraging avoidance (Davey & Matchett, 1994).

2.4.3. Appraisals of threat

The degree to which men and women experience events as unpredictable, uncontrollable, or overwhelming, may also help to explain why women appear to be more impacted than men by adverse events (Cohen, Kamarck, & Mermelstein, 1983). Compared to men, women are more likely to overestimate the probability of danger (Menzies & Clarke 1995), to expect harm, and to anticipate poor coping ability (Thorpe & Salkovskis, 1995). From an evolutionary perspective, vigilance toward potential threat and a tendency to judge ambiguous situations as threatening may be hypothesized as adaptive for women by encouraging them to preserve the safety of the self and offspring (Wood & Eagly, 2002). In support of this idea, and parallel to the information processing differences, recent brain imaging studies have found gender differences in the activation of neural structures thought to mediate attention to threat. McClure, Monk, Nelson, Zarahn, and Leibenluft (2004) found that adult women showed greater activation in the orbitofrontal cortex and amygdala when presented with threat cues. No gender differences were observed among adolescents, however, suggesting that the gender differences in patterns of neural responses to emotional faces are not apparent until adulthood.

2.4.4. Uncontrollability

Early childhood experience with diminished control may result in a cognitive style that increases the probability of interpreting events as threatening (Chorpita & Barlow, 1998). Citing research indicating that mother-son dyads demonstrate greater coordination in affective and behavioral displays (e.g., matching facial expressions or direction of attention) than mother-daughter dyads, Craske (2003) suggests that lower synchronicity between mothers and daughters establishes a weaker base of predictability and controllability that puts women at greater risk for anxiety disorders. In adulthood, women report a lower sense of personal control over their lives than men (Ross & Mirowsky, 2002; Thoits, 1987). Thus, in the context of a weaker base of predictability and controllability, women may have fewer opportunities for successful mastery and coping. For example, several studies have shown that caregivers and teachers are more responsive to the actions of boys than girls (Nolen-Hoeksema, 1990). As a result, girls may learn that their behavior has less impact on the environment, which may contribute to a sense of uncontrollability and an attributional style that places them at a greater risk for anxiety and mood disorders (Barlow, 1991; Foa & Riggs, 1994; Nolen-Hoeksema, 1990).

2.4.5. Self-efficacy

Self-efficacy in one's ability to cope with potential threat is a strong predictor of avoidance behavior (Emmelkamp & Felten, 1985). Research among non-clinical samples suggests that women tend to report lower self-efficacy than men (Buchanan & Selmon, 2008; see Bandura, 1997). The manner in which caregivers respond to children's expression of emotion is important to the development of self-efficacy. For example, in a prospective study of 91 mothers of elementary school children who completed a daily checklist of parenting behaviors, Pomerantz and Ruble (1998) found that mothers were more likely to report using control without autonomy-granting with their daughters, but tended to employ control with autonomy-granting with their sons. Furthermore, the greater use of control without autonomy-granting toward girls partly accounted for the finding that girls self-reported a greater tendency take responsibility for failure than boys. The authors suggest that greater caregiver control toward girls may contribute to a heightened vulnerability for anxiety when failure is encountered. Additionally, Krohne and Hock (1991) found that mothers of highly anxious girls tended to maintain control during a problem-solving task, whereas mothers of non-anxious girls were less controlling. This pattern was reversed among boys: mothers of highly anxious boys were less controlling during the problem-solving task than mothers of non-anxious boys. These findings suggest that the influence of caregiver over-control may selectively impact the development and maintenance of anxiety symptoms among girls.

2.4.6. Worry

Worry is a cognitive component of anxiety that is elicited under conditions of uncertainty and which focuses attention toward threat (Borkovec, Shadick, & Hopkins, 1991). Research indicates that most self-reported adult worriers are women (Robichaud, Dugas, & Conway, 2003). With one exception (Suarez & Bell-Dolan, 2001), this pattern of gender difference has also been found among samples of children (Campbell & Rapee, 1994) and preadolescents (Silverman, La Greca, & Wasserstein, 1995). It may be that the incongruent findings relate to methodological differences: Suarez and Bell-Dolan examined worry by children's responses to vignettes, whereas the other two studies involved self-reported worry only. Women's experience with certain uncontrollable life stressors (e.g. greater exposure to particular PTEs) and greater caregiver over-control may support a cognitive style characterized by worry and rumination.

Although worriers do not show deficits in knowledge of problem-solving skills, they tend to have a negative problem orientation, defined as low problem-solving confidence and low perceived control over the problem-solving process in the absence of actual problem-solving skills deficits. Research among non-clinical samples indicates that women's greater tendency to worry may be due, in part, to a more negative problem orientation (Robichaud et al., 2003). Women in this study reported greater worry and a more negative problem orientation than men. However, the gender difference in worry disappeared when controlling for women's more negative problem orientation. Thus, women's approach to problem-solving appears to be an important avenue for understanding how worry contributes to anxiety among women.

2.4.7. Rumination

A similar construct to worry, rumination is defined as thoughts or behaviors that focus attention toward depressive symptoms or their consequences, rather than toward pleasant or neutral topics (Nolen-Hoeksema, 1991). Rumination has been found to prolong anxious moods (Blagden & Craske, 1996). Compared to men, women are more likely to ruminate in response to dysphoric mood (Nolen-Hoeksema, 1991). Further, greater rumination among women is not attributable to higher levels of distress, greater emotional expressivity, or greater willingness to endorse socially undesirable traits (Nolen-Hoeksema & Jackson, 2001). Instead, gender differences in rumination are mediated by three beliefs, all of which were endorsed more by women than by men: negative emotions are difficult to control, a positive emotional tone of interpersonal relationships is a personal responsibility, and negative events are difficult to control (Nolen-Hoeksema & Jackson, 2001). It is not known whether women ruminate more than men in response to anxious mood. However, their tendency to focus attention on negative interpretations and outcome expectancies would likely increase state anxiety.

2.4.8. Heightened sensitivity to social cues

Compared to men, women are generally better at identifying affect in nonverbal cues (Hall, 1987). For example, gender differences in reactivity to facial expressions emerge at the same developmental time as differences in negative affectivity and socialization appear (Craske, 2003). Because facial expressions are a primary means of communicating danger, women's greater sensitivity to facial expressions places them at particular risk for developing fears and phobias (Craske, 2003). A vulnerability to socially-transmitted threat information may be especially detrimental to girls reared by anxious caregivers, given that they have more opportunities to learn about threat and avoidance. In fact, a study by Chorpita, Albano, and Barlow (1996) found that family discussions of ambiguously threatening situations led to increased avoidance behavior among anxious children (differences between boys and girls were not examined). Greater fear and anxiety among women may be influenced by two related factors. First, women may be more prone to vicarious fear conditioning because they are more sensitive to socially-transmitted information and are more attentive to others' expressions of fear. Second, women's distress following aversive experiences may be inflated subsequent to ruminative reevaluation of the threat-value of stimuli.

2.5. Behavioral avoidance

Avoidance is central to onset and maintenance of anxiety disorders (Barlow, 2001; Mowrer, 1960). Gender socialization that encourages exposure to feared stimuli facilitates the emotional processing of feared stimuli. Gender differences in fears and phobias increase throughout childhood, which may reflect differential extinction rates to developmentally appropriate fears (Fredrikson, Annas, & Fischer, 1996). If boys are more encouraged to confront fears and more dissuaded to avoid feared situations than girls, this reinforcement may motivate behavior that affords opportunities for emotional processing of fears. In this context, evidence showing that there are few gender

differences in social fears relative to other types of anxiety may be due to equal levels of reinforcement for approaching social situations. Reinforcement patterns that support avoidance among girls may thwart opportunities for them to emotionally process fears, thereby preventing extinction of existing fears and inhibiting the development of self-efficacy.

2.6. Environmental influences

2.6.1. Sociocultural influences

Coping strategies are shaped by social, cultural, and developmental contexts that influence men and women differently. As noted by Chambless (1989), in Western societies, the typical age of onset for agoraphobia corresponds with a developmental period marked by separation issues (e.g., leaving the home, beginning a career) and the adoption of multiple roles and obligations, which may be more difficult for women. Difficulty coping with separation, especially when combined with low autonomy, is a risk factor for agoraphobia (Chambless & Goldstein, 1981), which suggests that agoraphobia may be less common in cultures where separation issues are minimized and role obligations are more limited. In some non-Western cultures, in which it is more culturally acceptable for women to stay home (unless accompanied by an adult male), symptoms of agoraphobia are reportedly low (Kirmayer, Young, & Hayton, 1995). For example, El-Islam (1994) found that women in Qatar reported lower levels of agoraphobia than women in the U.S. The authors hypothesized that this cross-cultural discrepancy may be due to the fewer, more clearly defined social role obligations in the Qatari culture than in American culture.

Arrindell and colleagues (2003) examined how agoraphobic fears relate to masculinity measured at a national level across 11 countries. National masculinity was defined as the degree to which the society delineates distinct and rigid gender roles and upholds strong patriarchal values. A significant relationship was found between national levels of masculinity and agoraphobic fears, such that the greater the rigidity in gender roles at the sociocultural level, the more likely that men and women endorsed agoraphobic fears. Patriarchal societies that de-emphasize assertiveness and independence among women may create sociocultural contexts that foster fearfulness and avoidant coping (Arrindell et al., 2003). This conclusion appears to be at odds with the findings of El-Islam (1994) who found that low agoraphobic fears were related to the limited, defined social role obligations of patriarchal Qatar. It could be that agoraphobic fears were low among the Qatarian women because the women in this culture have few opportunities to leave their home unaccompanied. However, given that Arrindell and colleagues (2003) did not sample women from any Middle Eastern countries and that there is evidence of considerable variation in gender roles across cultures (Basow, 1984; Chia, Moore, Lam, Chuang, & Cheng, 1994), it would be premature to draw conclusions regarding these discrepant findings.

2.6.2. Gender role socialization

Social patterns of reinforcement for girls and boys differ in ways that are critical to understanding the gender differences in anxiety. Bem's (1981) gender role theory asserts that boys and girls are socialized to develop socially prescribed behaviors, traits, skills, and interests that are consistent with their gender. Thus, because the expression of anxiety is inconsistent with the male gender role, fearful behavior may be less tolerated in boys. Caregivers and other socialization agents (e.g., teachers, peers, and media) may encourage gender conforming behaviors by differentially reinforcing agency and assertiveness among boys and anxious behaviors among girls. Research indicates that parents consider withdrawal and inhibition to be less acceptable as boys get older, but not for girls (Stevenson-Hinde & Shouldice, 1993).

There is considerable evidence demonstrating that gender role is significantly related to symptoms of anxiety and fear (Chambless & Mason, 1986; Ollendick, King, & Muris, 2002). Research consistently has found a significant association between scores on standard fear scales, such as the Fear Survey Schedule (Wolpe & Lang, 1977) or the Fear Survey Schedule for Children-II (Gullone & King, 1993), and gender role scales, such as the Bem Sex Role Inventory, which measure the degree to which individuals endorse personality characteristics consistent with social conceptions of masculine and feminine gender roles. Among children, greater fear reporting has been associated with higher levels of femininity (Muris, Meesters, & Knoops, 2005) and lower levels of masculinity (Ginsburg & Silverman, 2000). Similar findings are seen in adults, with some studies demonstrating a positive relationship between fear and femininity (Dillon, Wolf, & Katz, 1985; Tucker & Bond, 1997), others showing a negative association with masculinity (Arrindell, 2000), and others finding that both high femininity and low masculinity are related to elevated fear (Carey, Dusek, & Spector, 1988). Several studies have found a significant relationship between femininity and trait anxiety (Bander & Betz, 1981; Biaggio & Nielsen, 1976; Gall, 1969).

Additionally, Bander and Betz (1981) found that gender differences were greater for math anxiety (a gender-stereotypic domain) than in test anxiety (a gender-neutral domain), suggesting that the magnitude of gender difference depends on the type of anxiety. Todman and Day (2006) found that gender role significantly predicted computer-related anxiety even when controlling for gender and department type (arts vs. engineering), revealing that gender differences in certain domain-specific types of anxiety may relate to gender role socialization.

Moscovitch, Hofmann, and Litz (2005) found that masculinity was significantly negatively related to social anxiety, whereas biological sex was unrelated to social anxiety. This study also found that self-perceived levels of independence and interdependence predicted social anxiety differently among men and women. In men, lower levels of independence and higher levels of interdependence were associated with greater social anxiety, whereas this pattern was reversed among women. These findings may support a self-discrepancy theory in which social anxiety increases among men and women when self-perceptions run counter to social mores. Thus, individuals who can be flexible across situations, regardless of the gender-related social demands of the situation, feel less social anxiety and discomfort. This is consistent with data showing that androgynous women (who are likely to be flexible across situations) report the lowest levels of social-evaluative fears (Goodman & Kantor, 1983). Further examination of how perceived gender role and ideal gender role relate with social anxiety may help explain why gender differences in social anxiety are markedly small, relative to other anxiety disorders.

If expression of fear and avoidance is less acceptable among men, boys may learn that the masculine role involves bravery and purposeful coping behavior when faced with anxiety-provoking situations (Bem, 1981). Greif, Alvarez, and Ulman (1981) found that mothers are more likely to discuss emotional states with their daughters, whereas they are more likely to discuss the causes and consequences of the feelings with their sons. Boys are thus encouraged to focus on problem-solving and gaining control over their emotion, rather than on the experience of the emotion itself. Learning to cope with anxiety in this problem-focused manner may help equip men with the instrumental traits and skills that prevent excessive fears or other anxiety disorders from developing. In contrast, a traditional feminine gender role that deemphasizes autonomy and mastery while promoting dependency and expectations of protection would be more compatible with avoidance behavior.

3. Conclusion

Substantial evidence points to a preponderance of women demonstrating greater fear and anxiety than men across the life span. Many of

the risk factors for developing anxiety form the basis for the expected gender differences. For example, women tend to score higher on higher-order vulnerability factors including negative affectivity and trait anxiety. Further, genetic research suggests that these factors are more heritable among women for reasons that are still unclear. One possibility is that environmental factors counteract anxious tendencies among boys but support them among girls. Although few temperamental differences are observed in very young infants, there is a shift toward greater negative affectivity among girls during the developmental period at which gender socialization becomes evident. Timing of this shift implicates environmental influences such as gender socialization.

Much of the hormonal and physiological data for gender differences appear contradictory. Several studies suggest that men are somewhat more physiologically reactive than women in response to acute stressors. While seemingly inconsistent with broad gender differences in anxiety, this finding is consistent with women's greater tendency to worry, which is known to decrease physiological reactivity. It is also consistent with evidence that oxytocin production among women leads to lower arousal and stress responding. Evidence that men are more responsive to acute threat, whereas women are more distressed by potential threat also fits well with the tend-and-befriend stress response articulated by Taylor et al. (2000). However, through hypervigilance to threat and prioritizing social networks, the tend-and-befriend response may lower women's perceived coping ability and encourage avoidance.

Although women are not more prone to experience traumas overall, they are more likely to experience certain types of trauma, including sexual abuse and social network crises, which may be particularly potent risk factors for anxiety. Further, in response to aversive events, women are more likely to use emotion-focused coping which is less effective in reducing distress than problem-focused coping strategies.

Through lower parent-child synchronicity and caregiver over-protection, girls may have less opportunity to exert control over their environment. As a result, women may perceive themselves as less capable of coping with potentially threatening situations. Lower self-efficacy may, in turn, motivate women to rely on a threat-based style of responding and to cope with uncertainty through avoidance. Avoidant coping among women is consistent with traditional gender roles, in which men and women are expected to respond to potential threat differently. Thus, the female stress response, as viewed from an evolutionary perspective that emphasizes the need to protect and nurture offspring, may be reinforced by gender socialization processes that support worry, sensitivity to socially-transmitted information, and avoidant coping.

In sum, gender differences in fear and anxiety are greatest when 1) examining molar levels versus biological levels of analysis and 2) examining individuals after the age at which socialization factors begin to exert influence. Genetic vulnerabilities gradually evolve into fully articulated traits through complex, bidirectional interactions with environmental factors. Thus, gender differences at each level of analysis are likely moderated by socialization processes that prescribe gender-specific expectations regarding the expression of anxiety and the acceptable means of coping with anxiety. These socialization factors influence expression of traits by shaping patterns of reinforcement that cultivate and promote processes related to anxiety.

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